

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Applicant: Kie Y. Ahn et al.

Title: LANTHANIDE OXIDE / HAFNIUM OXIDE DIELECTRIC LAYERS

Docket No.: 1303.101US1

Filed: June 24, 2003

Examiner: Unknown

Serial No.: 10/602323

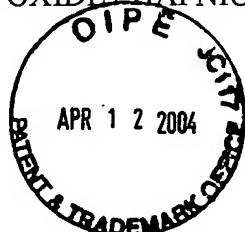
Due Date: N/A

Group Art Unit: 2812

Commissioner for Patents

P.O. Box 1450

Alexandria, VA 22313-1450



We are transmitting herewith the following attached items (as indicated with an "X"):

- A return postcard.
- A Communication Concerning Related Applications (4 pgs.).
- An Information Disclosure Statement (2 pgs.), Form 1449 (2 pgs.), and copies of 28 cited documents.

If not provided for in a separate paper filed herewith, Please consider this a PETITION FOR EXTENSION OF TIME for sufficient number of months to enter these papers and please charge any additional fees or credit overpayment to Deposit Account No. 19-0743.

SCHWEGMAN, LUNDBERG, WOESSNER & KLUTH, P.A.

Customer Number 21186

By: David R. Cochran  
Atty: David R. Cochran  
Reg. No. 46,632

CERTIFICATE UNDER 37 CFR 1.8: The undersigned hereby certifies that this correspondence is being deposited with the United States Postal Service with sufficient postage as first class mail, in an envelope addressed to: Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450, on this 8<sup>th</sup> day of April, 2004.

Name

Judy Mosher

Signature

Judy Mosher

SCHWEGMAN, LUNDBERG, WOESSNER & KLUTH, P.A.

(GENERAL)



S/N 10/602323

PATENT

**IN THE UNITED STATES PATENT AND TRADEMARK OFFICE**

Applicant: Kie Y. Ahn et al. Examiner: Unknown  
Serial No.: 10/602323 Group Art Unit: 2812  
Filed: June 24, 2003 Docket: 1303.101US1  
Title: LANTHANIDE OXIDE / HAFNITUM OXIDE DIELECTRIC LAYERS

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**INFORMATION DISCLOSURE STATEMENT**

Commissioner for Patents  
P.O. Box 1450  
Alexandria, VA 22313-1450

In compliance with the duty imposed by 37 C.F.R. § 1.56, and in accordance with 37 C.F.R. §§ 1.97 *et. seq.*, the enclosed materials are brought to the attention of the Examiner for consideration in connection with the above-identified patent application. Applicants respectfully request that this Information Disclosure Statement be entered and the documents listed on the attached Form 1449 be considered by the Examiner and made of record. Pursuant to the provisions of MPEP 609, Applicants request that a copy of the 1449 form, initialed as being considered by the Examiner, be returned to the Applicants with the next official communication.

Pursuant to 37 C.F.R. § 1.97(b), it is believed that no fee or statement is required with the Information Disclosure Statement. However, if an Office Action on the merits has been mailed, the Commissioner is hereby authorized to charge the required fees to Deposit Account No. 19-0743 in order to have this Information Disclosure Statement considered.

INFORMATION DISCLOSURE STATEMENT

Serial No :10/602323

Filing Date: June 24, 2003

Title: LANTHANIDE OXIDE / HAFNIUM OXIDE DIELECTRIC LAYERS

Page 2  
Dkt: 1303.101US1

The Examiner is invited to contact the Applicants' Representative at the below-listed telephone number if there are any questions regarding this communication.

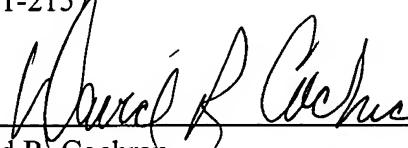
Respectfully submitted,

KIE Y. AHN ET AL.

By their Representatives,

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Date 8 APRIL 2004

By   
David R. Cochran  
Reg. No. 46,632

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Judy Mosher  
Name

  
Signature

S/N 10/602323

PATENT

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Applicant: Kie Y. Ahn et al.

Examiner: Unknown

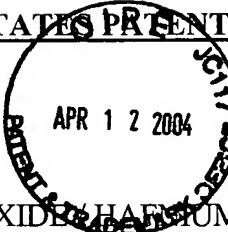
Serial No.: 10/602323

Group Art Unit: 2812

Filed: June 24, 2003

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Title: LANTHANIDE OXIDES/HAFNIOXIDE DIELECTRIC LAYERS



COMMUNICATION CONCERNING RELATED APPLICATION(S)

Commissioner for Patents  
P.O. Box 1450  
Alexandria, VA 22313-1450

Applicants would like to bring to the Examiner's attention the following related application(s) in the above-identified patent application:

<u>Serial/Patent No.</u>	<u>Filing Date</u>	<u>Attorney Docket</u>	<u>Title</u>
09/944981	August 30, 2001	1303.021US1	CRYSTALLINE OR AMORPHOUS MEDIUM-K GATE OXIDES, Y203 AND Gd203
09/945535	August 30, 2001	1303.026US1	HIGHLY RELIABLE AMORPHOUS HIGH-K GATE OXIDE ZrO <sub>2</sub>
10/028643	December 20, 2001	1303.030US1	LOW-TEMPERATURE GROWN HIGH QUALITY ULTRA-THIN CoTiO <sub>3</sub> GATE DIELECTRICS
10/052983	January 17, 2002	1303.031US1	HIGHLY RELIABLE AMORPHOUS HIGH-k GATE DIELECTRIC ZrO <sub>x</sub> N <sub>y</sub>
10/027315	December 20, 2001	1303.033US1	LOW-TEMPERATURE GROWN HIGH-QUALITY ULTRA-THIN PRASEODYMIUM GATE DIELECTRICS
09/797324	March 1, 2001	303.717US1	METHODS, SYSTEMS, AND APPARATUS FOR UNIFORM CHEMICAL-VAPOR DEPOSITIONS
10/099194	March 13, 2002	1303.044US1	EVAPORATION OF Y-Si-O FILMS FOR MEDIUM-k DIELECTRICS
10/081439	February 20, 2002	1303.046US1	EVAPORATED LaAlO <sub>3</sub> FILMS FOR GATE DIELECTRICS

10/137058	May 2, 2002	303.802US1	ATOMIC LAYER DEPOSITION AND CONVERSION
10/137168	May 2, 2002	1303.048US1	METHODS FOR ATOMIC-LAYER DEPOSITION OF ALUMINUM OXIDES IN INTEGRATED CIRCUITS
10/137499	May 2, 2002	1303.050US1	ATOMIC LAYER-DEPOSITED LaAlO <sub>3</sub> FILMS FOR GATE DIELECTRICS
10/163481	June 5, 2002	1303.056US1	ATOMIC LAYER-DEPOSITED HfAlO <sub>3</sub> FILMS FOR GATE DIELECTRICS
10/163686	June 5, 2002	1303.059US1	Pr <sub>2</sub> O <sub>3</sub> -BASED La-oxide GATE DIELECTRICS
10/209581	July 30, 2002	1303.061US1	ATOMIC LAYER DEPOSITED NANOLAMINATES OF HfO <sub>2</sub> /ZrO <sub>2</sub> FILMS AS GATE DIELECTRICS
10/219870	August 15, 2002	1303.069US1	LANTHANIDE DOPED TiO <sub>x</sub> DIELECTRIC FILMS BY PLASMA OXIDATION
10/219878	August 15, 2002	1303.070US1	LANTHANIDE DOPED TiO <sub>x</sub> DIELECTRIC FILMS
10/229903	August 28, 2002	1303.078US1	ATOMIC LAYER DEPOSITED HfSiON DIELECTRIC FILMS
10/233309	August 29, 2002	1303.079US1	ATOMIC LAYER DEPOSITED LANTHANIDE DOPED TiO <sub>x</sub> DIELECTRIC FILMS
10/309583	December 4, 2002	1303.082US1	ATOMIC LAYER DEPOSITED ZR-SN- Ti-O FILMS USING TiI <sub>4</sub>
10/309935	December 4, 2002	1303.083US1	ATOMIC LAYER DEPOSITED Zr-Sn- Ti-O FILMS
10/379470	March 4, 2003	1303.090US1	ATOMIC LAYER DEPOSITED DIELECTRIC LAYERS

10/403734	March 31, 2003	1303.092US1	ATOMIC LAYER DEPOSITED ZrAl <sub>x</sub> O <sub>y</sub> DIELECTRIC LAYERS
10/420307	April 22, 2003	1303.097US1	ATOMIC LAYER DEPOSITED ZrTiO <sub>4</sub> FILMS
10/602315	June 24, 2003	1303.107US1	LANTHANIDE OXIDE / HAFNIUM OXIDE DIELECTRICS
09/779959 6,495,436	February 9, 2001	Unknown	FORMATION OF METAL OXIDE GATE DIELECTRIC
09/838335 6514828	April 20, 2001	Unknown	METHOD OF FABRICATING A HIGHLY RELIABLE GATE OXIDE
09/881408	June 13, 2001	Unknown	DIELECTRIC LAYER FORMING METHOD AND DEVICES FORMED THEREWITH
09/908767 6534420	July 18, 2001	Unknown	METHODS FOR FORMING DIELECTRIC MATERIALS AND METHODS FOR FORMING SEMICONDUCTOR DEVICES
10/765619	January 27, 2004	1303.033US2	LOW-TEMPERATURE GROWN HIGH-QUALITY ULTRA-THIN PRASEODYMIUM GATE DIELECTRICS
10/768597	January 30, 2004	1303.033US3	LOW-TEMPERATURE GROWN HIGH-QUALITY ULTRA-THIN PRASEODYMIUM GATE DIELECTRICS
10/789042	February 27, 2004	1303.050US2	ATOMIC LAYER-DEPOSITED LaAlO <sub>3</sub> FILMS FOR GATE DIELECTRICS
10/789044	February 27, 2004	1303.070US2	LANTHANIDE DOPED TiO <sub>x</sub> DIELECTRIC FILMS

Unknown	October 10, 2003	Unknown	LANTHANIDE OXIDE/ ZIRCONIUM OXIDE ATOMIC LAYER DEPOSITED NANOLAMINATE GATE DIELECTRICS
10/052983	January 17, 2002	Unknown	HIGHLY RELIABLE AMORPHOUS HIGH K GATE DIELECTRIC ZROXNY
10/225715	August 21, 2002	Unknown	COMPOSITE DIELECTRIC FORMING METHODS AND COMPOSITE DIELECTRICS
10/352507	January 27, 2003	Unknown	ATOMIC LAYER DEPOSITION OF METAL OXYNITRIDE LAYERS AS GATE DIELECTRICS AND SEMICONDUCTOR DEVICE STRUCTURES UTILIZING METAL OXYNITRIDE LAYERS

Respectfully submitted,

KIE Y. AHN ET AL.

By Applicants' Representatives,

SCHWEGMAN, LUNDBERG, WOESSNER & KLUTH, P.A.  
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(612) 371-2157

Date 8 April 2004 By David R. Cochran  
David R. Cochran  
Reg. No. 46,632

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Judy Mosher  
Name

Judy Mosher  
Signature

<p>Substitute for form 1449A/PTO <b>INFORMATION DISCLOSURE STATEMENT BY APPLICANT</b> (Use as many sheets as necessary)</p> <p style="text-align: center;">APR 12 2004 PATENTS &amp; TRADEMARKS U.S. DEPARTMENT OF COMMERCE</p>		<p>Complete if Known</p> <table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <td style="width: 45%; padding: 2px;">Application Number</td> <td style="width: 55%; padding: 2px;">10/602323</td> </tr> <tr> <td>Filing Date</td> <td>June 24, 2003</td> </tr> <tr> <td>First Named Inventor</td> <td>Ahn, Kie</td> </tr> <tr> <td>Group Art Unit</td> <td>2812</td> </tr> <tr> <td>Examiner Name</td> <td>Unknown</td> </tr> </table>					Application Number	10/602323	Filing Date	June 24, 2003	First Named Inventor	Ahn, Kie	Group Art Unit	2812	Examiner Name	Unknown
Application Number	10/602323															
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First Named Inventor	Ahn, Kie															
Group Art Unit	2812															
Examiner Name	Unknown															
		Attorney Docket No: 1303.101US1														
Sheet 1 of 2																

US PATENT DOCUMENTS						
Examiner Initial *	USP Document Number	Publication Date	Name of Patentee or Applicant of cited Document	Class	Subclass	Filing Date If Appropriate
	US-2003/0042526	03/06/2003	Weimer, Ronald A.	257	309	08/29/2001
	US-2003/0052356	03/20/2003	Yang, Haining , et al.	257	309	10/11/2002
	US-2003/0052358	03/20/2003	Weimer, Ronald A.	257	310	10/25/2002
	US-2003/0102501	06/05/2003	Yang, Haining , et al.	257	295	12/12/2002
	US-2003/0119313	06/26/2003	Yang, Haining , et al.	438	681	12/05/2002
	US-2003/0222300	12/04/2003	Basceri, Cem , et al.	257	309	03/13/2003
	US-2003/0228747	12/11/2003	Ahn, Kie Y., et al.	438	591	06/05/2002
	US-6,120,531	09/19/2000	Zhou, Lin , et al.	607	111	10/17/1997
	US-6,187,484	02/13/2001	Glass, Thomas R., et al.	430	5	08/31/1999
	US-6,518,610	02/11/2003	Yang, Haining , et al.	257	295	02/20/2001
	US-6,524,867	02/25/2003	Yang, Haining , et al.	438	3	12/28/2000
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	US-6,593,610	07/15/2003	Gonzalez, Fernando	257	296	12/13/2001
	US-6,608,378	08/19/2003	Ahn, Kie Y., et al.	257	701	08/26/2002
	US-6,613,702	09/02/2003	Sandhu, Gurtej S., et al.	438	798	01/17/2003
	US-6,661,058	12/09/2003	Ahn, Kie Y., et al.	257	344	02/11/2002
	US-6,683,005	01/27/2004	Sandhu, Gurtej S., et al.	438	715	01/17/2003

FOREIGN PATENT DOCUMENTS						
Examiner Initials*	Foreign Document No	Publication Date	Name of Patentee or Applicant of cited Document	Class	Subclass	T <sup>2</sup>

OTHER DOCUMENTS -- NON PATENT LITERATURE DOCUMENTS			
Examiner Initials*	Cite No <sup>1</sup>	Include name of the author (in CAPITAL LETTERS), title of the article (when appropriate), title of the item (book, magazine, journal, serial, symposium, catalog, etc.), date, page(s), volume-issue number(s), publisher, city and/or country where published.	T <sup>2</sup>
		AARIK, JAAN , et al., "Influence of substrate temperature on atomic layer growth and properties of HfO <sub>x</sub> sub 2 / thin films", <i>Thin Solid Films</i> , 340(1-2), (1999), 110-116	

EXAMINER

DATE CONSIDERED

Substitute for form 1449A/PTO

**INFORMATION DISCLOSURE  
STATEMENT BY APPLICANT**

(Use as many sheets as necessary)



Complete if Known

<b>Application Number</b>	10/602323
<b>Filing Date</b>	June 24, 2003
<b>First Named Inventor</b>	Ahn, Kie
<b>Group Art Unit</b>	2812
<b>Examiner Name</b>	Unknown

Sheet 2 of 2

Attorney Docket No: 1303.101US1

	BENDORAITIS, J G., et al., "Optical energy gaps in the monoclinic oxides of hafnium and zirconium and their solid solutions", <u>Journal of Physical Chemistry</u> , 69(10), (1965),3666-3667	
	GUTOWSKI, M J., "Thermodynamic stability of high-K dielectric metal oxides ZrO <sub>2</sub> and HfO <sub>2</sub> in contact with Si and SiO <sub>2</sub> ", <u>Applied Physics Letters</u> , 80(11), (March 18, 2002),1897-1899	
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	KUKLI, K , et al., "Comparison of hafnium oxide films grown by atomic layer deposition from iodide and chloride precursors", <u>Thin Solid Films</u> , 416, (2002),72-79	
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	KUKLI, K J., et al., "Properties of hafnium oxide films grown by atomic layer deposition from hafnium tetraiodide and oxygen", <u>Journal of Applied Physics</u> , 92(10), (November 15, 2002),5698-5703	
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	SNEH, OFER , et al., "Thin film atomic layer deposition equipment for semiconductor processing", <u>Thin Solid Films</u> , 402(1-2), (Jan. 1, 2002),248-261	
	ZHANG, H , et al., "High permittivity thin film nanolaminates", <u>Journal of Applied Physics</u> , 87(4), (February 2000),1921-1924	

EXAMINER

DATE CONSIDERED

Substitute Disclosure Statement Form (PTO-1449)

\* EXAMINER: Initial if reference considered, whether or not citation is in conformance with MPEP 809. Draw line through citation if not in conformance and not considered. Include copy of this form with next communication to applicant. 1 Applicant's unique citation designation number (optional) 2 Applicant is to place a check mark here if English language Translation is attached